

Designer Fluid for use in a Single Loop Variable Heat Rejection Thermal Control System, Phase II Project

SBIR/STTR Programs | Space Technology Mission Directorate (STMD)



ABSTRACT

The efficient thermal control of vehicles is essential to the success of every single NASA mission. All vehicles have very tight requirements for the thermal control systems while simultaneously placing incredibly stringent demands upon them. These demands are getting even more intense given the shift towards variable heat rejection, which is essential in missions reaching beyond the lower earth orbit. Specifically, the thermal control fluid must maintain excellent thermal properties for heat rejection under peak conditions while at the same time remain liquid at extremely low temperatures. Currently used fluids either do not meet the low temperature requirement (glycol/water mixture) or do not have thermal properties conducive to a compact, efficient system (Galden). Mainstream has identified several promising next generation thermal fluids using computation chemical techniques. Mainstream has already demonstrated in Phase I that these fluids are superior to incumbent fluids. In Phase II, Mainstream will perform more long term durability, compatibility and performance studies in a simulated test-loop representative of conditions encountered on NASA spacecraft.

ANTICIPATED BENEFITS

To NASA funded missions:

Potential NASA Commercial Applications: This program will result in a fluid or family of fluids providing a significant benefit to NASA in enabling efficient variable heat rejection thermal control systems. The fluids will be formulated at Mainstream complete with any necessary additive packages to ensure stability, materials compatibility and safety. The commercial market for these fluids within NASA is immense and includes essentially every spacecraft which would require a single phase thermal control loop.

To the commercial space industry:

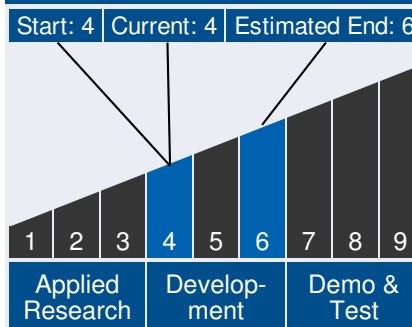
Potential Non-NASA Commercial Applications: In addition to an



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Technology Maturity



Management Team

Program Executives:

- Joseph Grant
- Laguduva Kubendran

Program Manager:

- Carlos Torrez

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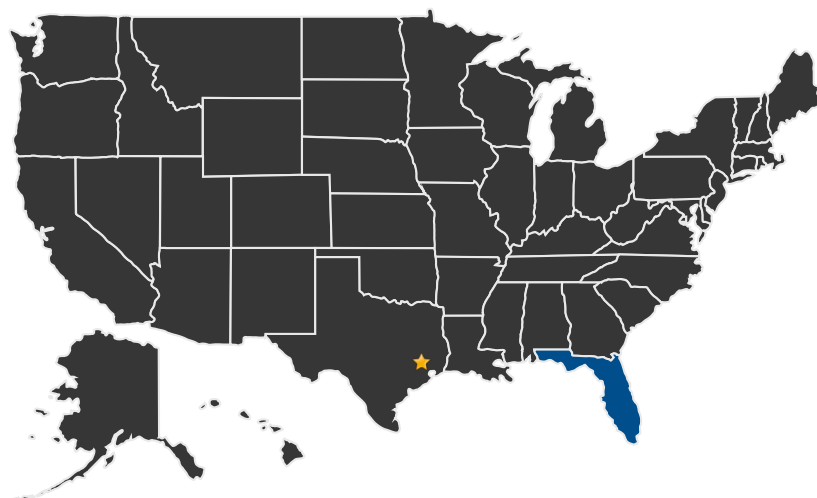
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attractive market within NASA, these fluids will have far reaching effects in other commercial markets as well. These applications include freeze protection, process cooling, refrigeration coil defrosting and sub-ambient dehumidification.

U.S. WORK LOCATIONS AND KEY PARTNERS



■ U.S. States
With Work

★ **Lead Center:**
Johnson Space Center

Other Organizations Performing Work:

- Mainstream Engineering Corporation (Rockledge, FL)

PROJECT LIBRARY

Presentations

- Briefing Chart
 - (<http://techport.nasa.gov:80/file/23420>)

Management Team *(cont.)*

Principal Investigator:

- Ted Amundsen

Technology Areas

Primary Technology Area:

Thermal Management
Systems (TA 14)

- └ Thermal Control Systems (TA 14.2)
 - └ Heat Transport (TA 14.2.2)

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IMAGE GALLERY

COMPOUND	BOILING POINT (°C)	FLASH POINT (°C)	FLAMMABILITY (ASTM D-155)	HEAVY METAL CONTENT (ppm)	μ-100°C/μ-100°C	TURBULENT	LAMINAR	
						FIGURE OF MERIT	W ₁ /W ₂	k ₁ /k ₂
GALDEN HT 170	170	-	0	1	212	0.4	5.03	0.81
NOVEC 7200	76	-	1	1	12	1	1	1
MEC-1	183	59	2	0	31	0.91	1.95	1.63
MEC-2	172	92	1	1	26	0.92	1.83	1.56

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DETAILS FOR TECHNOLOGY 1

Technology Title

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Potential Applications

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